

Title Page

Business Research Document

Capstone Project

Project Title: BudgetPal – A Bill Splitting and Expense Management Web Application

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2. Executive Summary

Managing shared expenses often becomes a challenge for students, roommates, and working professionals due to manual calculations, lack of clarity, and difficulty in tracking who owes whom. This project aims to develop a **smart web-based expense management system** called **BudgetPal**, which automates the process of splitting bills and tracking shared costs among groups.

The application allows users to create groups, add expenses, and view settlements in real time, ensuring transparency and accuracy. Built using **React.js**, **Node.js**, **Express.js**, **PostgreSQL**, and **Supabase**, the system ensures secure authentication, seamless data management, and cloud-based accessibility.

The expected outcome is a **reliable, scalable, and user-friendly web platform** that simplifies expense management, enhances financial transparency among users, and reduces the effort and conflicts associated with manual bill splitting.

In addition, **BudgetPal contributes to improved financial literacy** by helping users monitor their spending habits and understand their financial responsibilities within shared environments.

3. Introduction

Managing shared expenses is a common challenge faced by students, roommates, colleagues, and families. Traditional methods such as manual calculations, note-taking, or basic messaging apps often lead to confusion, calculation errors, and lack of transparency. These outdated methods make it difficult to keep track of contributions, settlements, and outstanding balances among group members.

With the increasing number of shared living situations, group trips, and collaborative projects, there is a growing need for a **real-time, automated, and reliable solution** that simplifies expense management. A web-based bill-splitting system like **BudgetPal** bridges this gap by allowing users to record expenses, split costs automatically, and track settlements with accuracy and ease.

By leveraging modern technologies such as **React.js**, **Node.js**, **Express.js**, **PostgreSQL**, and **Supabase**, BudgetPal provides a seamless and secure digital platform for managing shared finances efficiently, ensuring clarity and accountability in every transaction.

Additionally, as digital payment adoption continues to rise globally, solutions like BudgetPal play an essential role in **modernizing personal finance management** by offering a transparent, user-friendly alternative to manual expense tracking.

4. Problem Statement

Managing shared expenses among groups such as friends, roommates, and colleagues often leads to confusion and disputes due to a lack of an organized and transparent system. Most people still rely on manual calculations, note-taking apps, or chat-based records to split bills, which are inefficient and prone to human error.

The absence of a **centralized digital platform** makes it difficult to track contributions, settlements, and pending balances accurately. This often results in misunderstandings, delayed repayments, and strained relationships among group members.

Furthermore, existing solutions are either too complex for casual users or lack essential features like real-time tracking, secure authentication, and analytics. This highlights the need for a **user-friendly, automated, and reliable expense management system** that ensures fairness, transparency, and accountability in group financial interactions.

5. Research Objectives

- To study existing expense management and bill-splitting applications and identify their limitations.
- To design and develop a web-based platform that automates expense tracking and cost sharing among users.
- To ensure secure and seamless data storage using **Supabase** and **PostgreSQL** integration.
- To implement group management features allowing users to create, join, and manage shared expense groups.
- To provide real-time insights and summaries through an interactive dashboard for better financial awareness.
- To evaluate the system's usability and accuracy through user testing and feedback.
- To simplify financial communication among group members by automating balance updates and settlements.
- To create a responsive, mobile-friendly interface ensuring accessibility across all devices.
- To enhance user experience with intuitive navigation, easy data entry, and clear visual analytics.
- To promote transparency and accountability in shared financial management through digital records and reports.

6. Literature Review / Market Research

- According to a 2024 **Statista** report, the global **personal finance management app market** is projected to reach **\$1.69 billion by 2028**, driven by increased digital payment adoption and financial awareness.
- Existing applications such as **Splitwise**, **Tricount**, and **Settle Up** help users divide expenses but often lack personalized analytics, simplified UI, or transparency in group settlements.
- Many users prefer lightweight, web-based solutions over heavy mobile apps, highlighting an opportunity for platforms like **BudgetPal**, which are accessible from any device without installation.
- A 2023 **PwC survey** revealed that over **65% of young adults** face difficulties managing shared expenses effectively due to poor record-keeping and miscommunication.
- The growing popularity of **cashless transactions** and **digital wallets** creates an ideal environment for integrated expense management systems that promote accountability and shared budgeting.
- With the rise of shared living, remote work teams, and group travel, there is a clear market demand for **real-time, transparent, and automated** financial management solutions.

7. Proposed Solution

A smart **web-based expense management and bill-splitting system (BudgetPal)** that:

- Automates the process of **splitting bills and tracking shared expenses** among groups such as roommates, friends, and colleagues.
- Allows users to **create and manage groups**, add shared expenses, and view settlements instantly.
- Utilizes **Supabase** for secure authentication and **PostgreSQL** for reliable, scalable data storage.
- Displays **real-time expense summaries and balances** through an interactive dashboard.
- Provides **monthly and spent reports** to help users understand their financial habits and track their contributions.
- Offers a **clean, responsive interface** built with React.js for accessibility across all devices.
- Ensures transparency and eliminates manual miscalculations, promoting trust among users.

8. Methodology

- **Research Method:**
Secondary data analysis and user feedback through practical testing with small user groups (students, roommates, and working professionals).
- **Technology Stack:**
 - **Frontend:** React.js (for building a responsive and user-friendly interface)
 - **Backend:** Node.js with Express.js (for managing APIs and server-side logic)
 - **Database:** PostgreSQL (for structured, scalable data management)
 - **Authentication & Hosting:** Supabase (for secure user authentication and real-time data syncing)
 - **Deployment:** Vercel (for smooth cloud-based deployment and accessibility)
- **Workflow:**
 1. User registers or logs in through Supabase authentication.
 2. User creates or joins a group to manage shared expenses.
 3. Each group member adds expenses, specifying the amount and participants.
 4. The system automatically calculates and updates individual balances using backend.
 5. Dashboard displays detailed analytics, settlements, and monthly spent reports.
 6. All data is securely stored and synced in PostgreSQL via Supabase.

9. Business Impact

- **Students and Roommates:** Simplifies expense sharing by automating bill splitting and tracking, reducing confusion and misunderstandings.
- **Working Professionals:** Makes it easier to manage shared costs during trips, events, or team activities with real-time tracking and transparency.
- **Families:** Helps maintain a clear record of household expenses and promotes better monthly budgeting.
- **Increased Financial Awareness:** Encourages users to be more conscious of their spending habits and promotes smarter money management.
- **Time Efficiency:** Eliminates the need for manual calculations or external spreadsheets by automating balance settlements and expense summaries.
- **Transparency and Trust:** Provides a clear view of who owes what, fostering accountability and reducing financial disputes in groups.
- **Data-Driven Insights:** Monthly and spending reports help users identify spending patterns and make informed budgeting decisions.

- **Scalability for Institutions and Teams:** The system can be extended for use in hostels, offices, and clubs to manage shared resources and common funds effectively.
- **Eco-Friendly Impact:** Reduces the need for paper-based records or manual tracking methods by digitizing all expense data.

10.Expected Outcomes

- A **fully functional, web-based expense management platform** that allows users to create groups, record transactions, and manage shared expenses efficiently through a clean and intuitive interface.
- **Seamless and secure user experience** enabled by authentication through Supabase, ensuring smooth login/signup, data protection, and account management for all users.
- **Accurate balance calculation system** that automatically computes who owes whom, eliminating confusion and manual calculations among group members.
- **Automated expense categorization and tracking**, enabling users to view where their money goes across various categories such as food, rent, entertainment, and travel.
- **Comprehensive analytics dashboard** displaying real-time insights on group spending, total balance, and expense trends using visual charts and summaries.
- **Monthly and spent reports generation**, allowing users to review their financial activities over time, identify saving opportunities, and plan better for upcoming expenses.
- **Improved transparency and accountability** among group members as all transactions and contributions are visible and traceable in one place.
- **Mobile-responsive design** ensuring that users can manage their expenses on any device, enhancing accessibility and convenience.
- **Reduced financial disputes** among group members by providing clear transaction records, verified updates, and fair balance breakdowns.
- **Potential for scalability**, allowing future expansion to include features like multi-currency support, payment gateway integration, and AI-based spending insights.
- **Enhanced user collaboration and communication** through group-based expense summaries, ensuring all members stay informed about shared financial activities.
- **Streamlined data management** using PostgreSQL and Supabase integration, ensuring efficient data storage, faster queries, and secure handling of financial information.

11. Limitations

- **No automated testing implemented** — All testing and validation are done manually, which may lead to oversight of minor bugs or UI inconsistencies.
- **Limited user base** — The current version of BudgetPal is deployed for pilot use within a small group, restricting large-scale performance and usability analysis.
- **Lack of real-time notifications** — Users do not receive instant updates for new expenses or balance changes; all updates are viewed manually through the dashboard.
- **No integration with external payment gateways** — The system currently focuses on tracking and managing expenses but doesn't support direct payments or settlements.
- **Limited reporting functionality** — While monthly and spent reports are included, advanced analytics (like predictive spending or savings insights) are not yet implemented.
- **Dependent on internet connectivity** — Since the application is web-based, users require a stable internet connection to access and update data.
- **Scalability not yet tested** — The system's performance with a large number of users or concurrent groups has not been fully evaluated.

12. Conclusion

The project successfully provides a comprehensive and efficient solution for managing shared and personal expenses through a web-based platform. It addresses the recurring challenges of financial mismanagement, confusion in group transactions, and lack of transparency by offering a centralized and intuitive system. The platform enables users to create groups, record and categorize expenses, and automatically calculate balances, ensuring clarity on who owes whom.

By integrating **Supabase** for authentication and database management using **PostgreSQL**, the system ensures data security, fast synchronization, and smooth user experience. Features like **monthly and spent reports**, **expense categorization**, and **real-time balance tracking** make financial management more structured and insightful.

This project not only enhances user convenience but also promotes **financial discipline**, **accountability**, and **collaboration** among group members. With its scalable architecture and clean UI, it can easily evolve into a more advanced platform by integrating **payment gateways**, **AI-driven spending analysis**, and **multi-currency support** in the future. Ultimately, this project lays a strong foundation for a transparent, accurate, and modern approach to digital expense management.

13. References

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